

July 25, 1933.

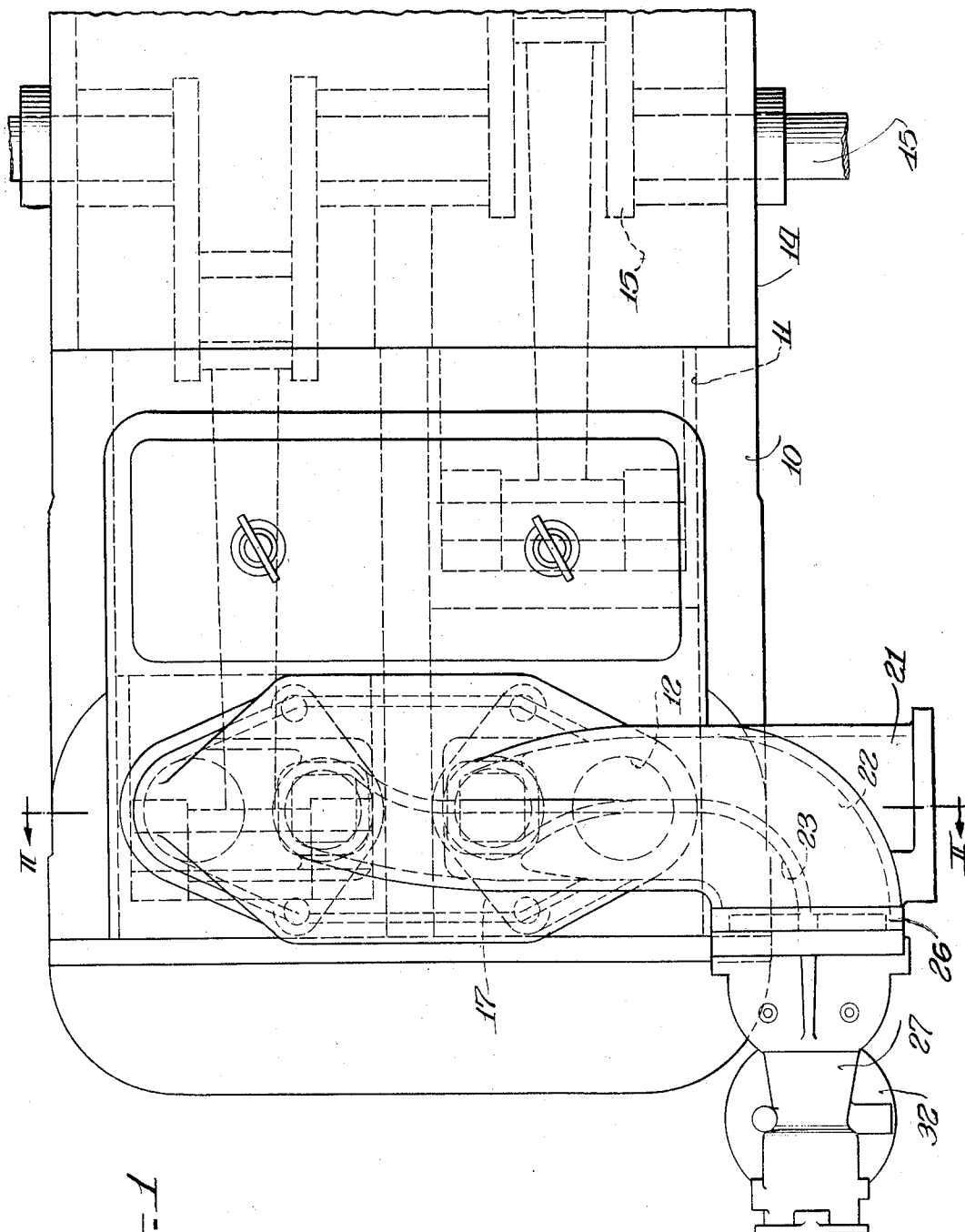
T. LINGA

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ENGINE

Filed June 4, 1930

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INVENTOR

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July 25, 1933.

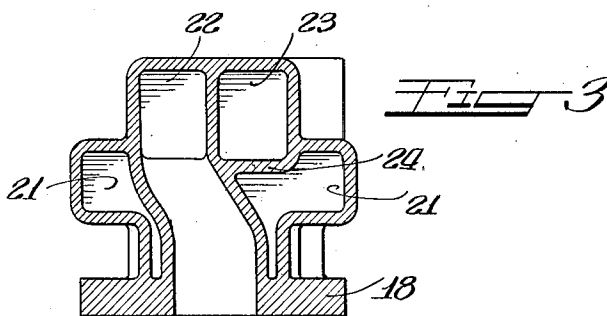
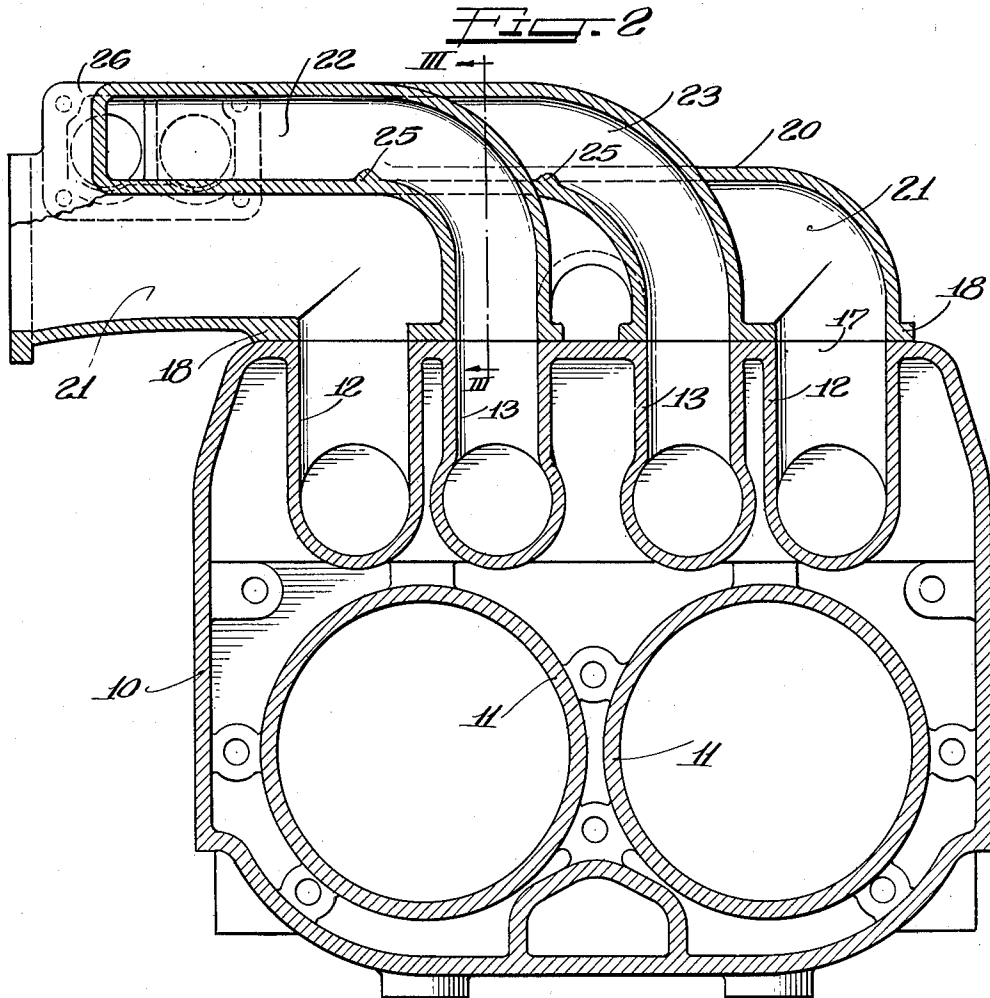
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FIG. 4

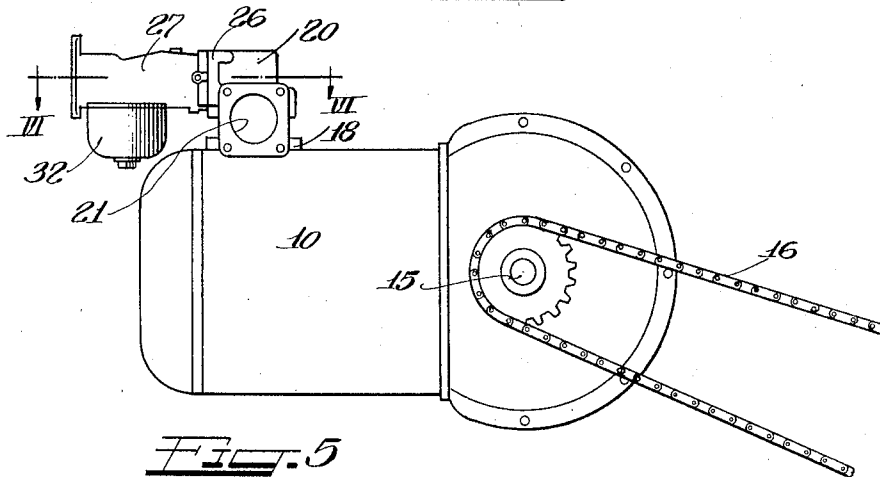
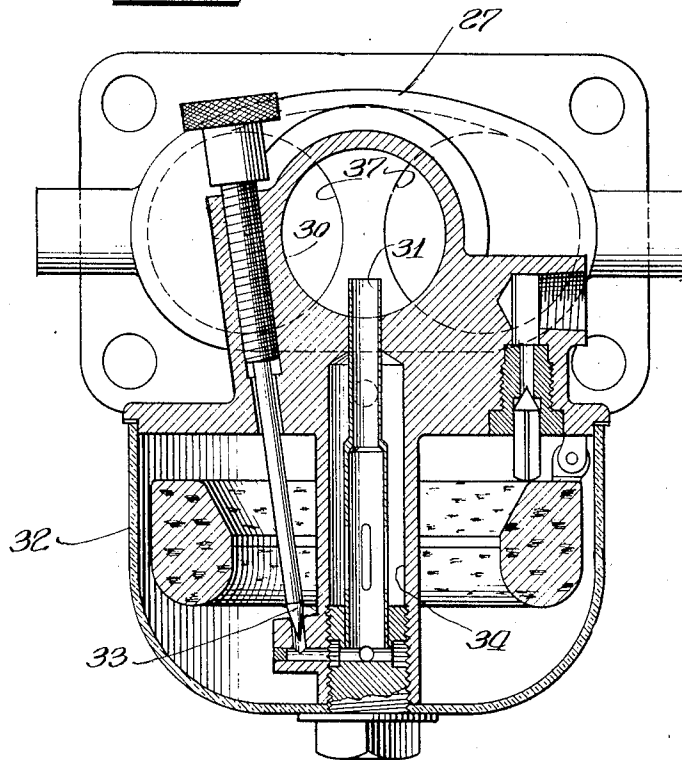


FIG. 5



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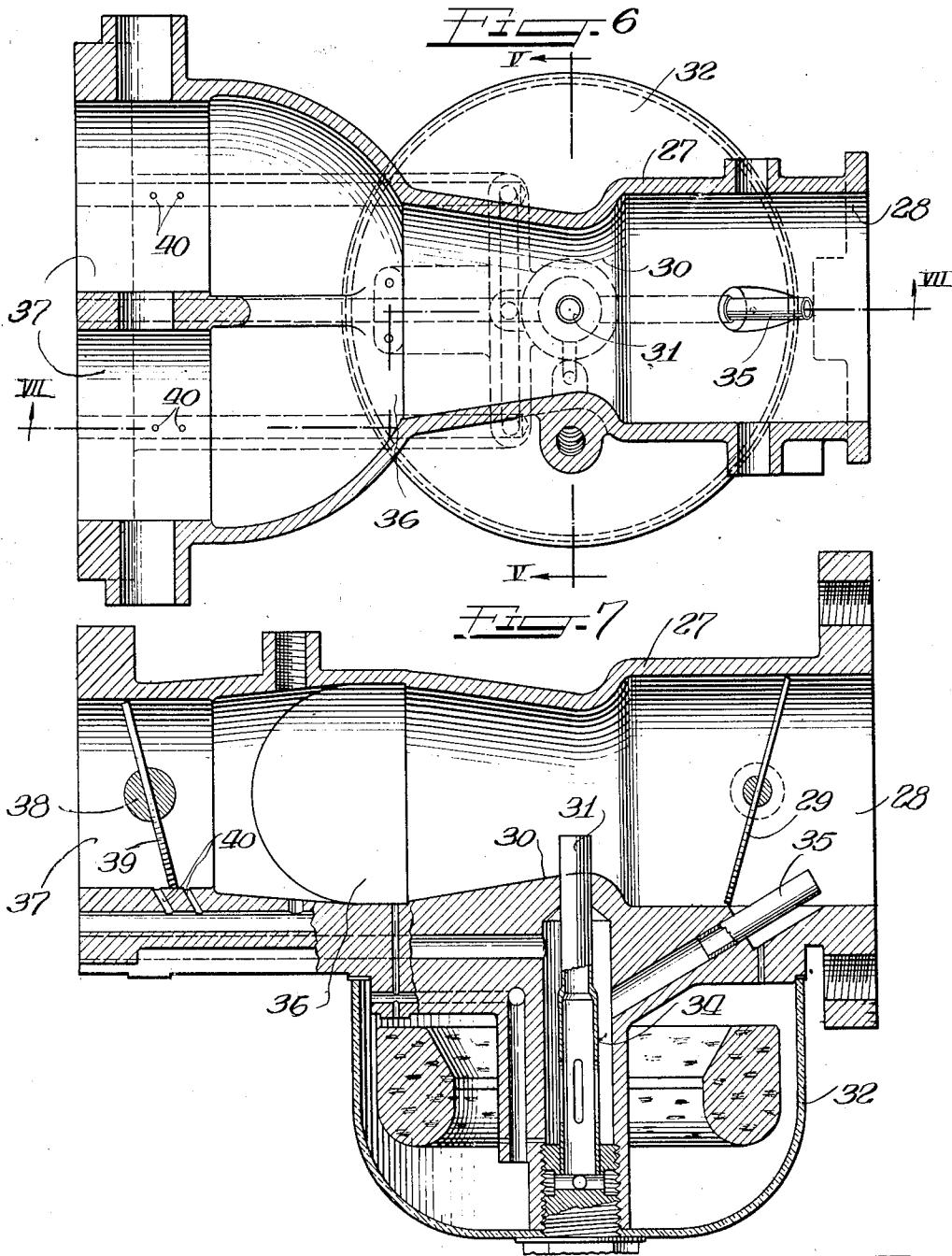
T. LINGA

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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ENGINE

Application filed June 4, 1930. Serial No. 459,239.

This invention relates to internal combustion engines of the four-stroke cycle type wherein the two cylinders fire successively and are so timed that thereafter there is a non-firing interval corresponding to the cycles of two cylinders, the parts during such non-firing interval continuing their movement because of the inertia thereof and of a flywheel operated thereby and due to energy stored during the firing strokes.

Such engines, because of their simplicity, ruggedness and compactness, are very desirable for use in tractors and motor boats and are used for such purpose to quite a large extent.

In this type of engine as heretofore provided, fuel mixture has been furnished to the cylinders from a single carbureter through a manifold communicating with a common intake port leading to a chamber in which are positioned the inlet valves of the adjacent cylinders. Such construction is objectionable in that due to increasing manifold depression after firing of the first cylinder, there is a tendency to "starve" the second cylinder of its proper share of combustible mixture. This is particularly objectionable at low or idling speeds and in many instances it is practically impossible to make an adjustment that will assure proper idling for more than a very short period of time due to the cumulative effect of this "starving" of the second cylinder and the consequent loading of the first cylinder to fire.

The present invention overcomes this difficulty by combining such an engine with a dual or double outlet carbureter, the outlets of which open into a divided manifold which in turn communicates with separate passages or chambers opening to the inlet valves of the respective cylinders. By virtue of this construction, each cylinder is assured its proper share of combustible mixture at all speeds and the objectionable "starving" of one cylinder and "loading" of the other cylinder is prevented.

It is a further object of the present invention to provide an engine structure of the kind described embodying an improved in-

let conduit affording a separate passage to each cylinder, said passages having a common wall which is also a wall of the exhaust conduit from the cylinders whereby the inflowing combustible mixture is brought to a proper temperature to insure complete vaporization and thorough mixture prior to entering the engine cylinder.

It is a further important object of this invention to provide a structure embodying a common inlet on the atmospheric side of the mixture throttling means and combined with separate passages to each cylinder beyond the throttling means or where the mixture is subjected to varying sub-atmospheric pressures.

In the accompanying drawings there is illustrated an embodiment of the present invention as employed in an L-head two-cylinder four-cycle internal combustion engine of the type described, but it is obvious that the novel combination of my invention is not limited to such specific construction of such a two-cylinder four-cycle engine.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

On the drawings:

Figure 1 is a plan view of a horizontal two cylinder internal combustion engine incorporating a carburetting system embodying the features of this invention.

Figure 2 is a vertical section on the line II—II of Figure 1 showing the manifold and port structure.

Figure 3 is a section of the manifold on the line III—III of Figure 2.

Figure 4 is a side elevation to a reduced scale of the engine of Figure 1.

Figure 5 is a cross section of the carbureter taken on the line V—V of Figure 6.

Figure 6 is a horizontal section of the carbureter taken on the line VI—VI of Figure 4.

Figure 7 is a longitudinal vertical section of the carbureter on the broken line VII—VII of Figure 6.

As shown on the drawings:

The engine forming part of the combina-

tion of this invention comprises a horizontal two cylinder four stroke cycle engine wherein the two throws of the crankshaft are set at 180° and because of the four stroke cycle the cylinders fire in sequence with an increased interval before the first cylinder fires again. A flywheel is relied upon to carry the engine over the dwell period between ignition sequences. With this arrangement the intake stroke of the second cylinder follows in immediate sequence to that of the first cylinder and in fact the two intake valves are actually open together for an appreciable interval, due to the usual overlapping timing wherein the intake valve opens before top center and closes after bottom center. Since the first cylinder will have established a flow thereto before the second cylinder commences its intake stroke, such flow will tend to continue as long as the valve of the first cylinder remains open, followed by a short dwell, due to the momentum of flow, before the flow will deflect to feed the second cylinder; when both cylinders are fed from a common manifold leading to siamesed ports. It has been found that with such an arrangement the effect is a cumulative starving of the second cylinder so that during idling for example the engine would operate satisfactorily for a few seconds but would then gradually slow down and finally stop within a comparatively short interval.

The engine of this invention comprises a cylinder block 10 having twin bores 11 each of which is served by individual exhaust and intake passages 12 and 13, the block 10 being attached to a crankcase 14 containing a two throw crankshaft 15. For the sake of simplicity the engine is shown with horizontal cylinders, and when used in a tractor for example the engine may be arranged with the crankshaft parallel to the axle, in which case a chain 16 may be used to deliver the engine power. The invention relates to a manifolding system for a two cylinder four stroke cycle engine with cranks at 180°, the horizontal position of the engine not being essential to this invention.

The exhaust and intake ports 12 and 13 extend through the water jacket space of the cylinder block to twin raised surfaces or lands 17 to which corresponding flanges 18 on the combined exhaust and intake manifold 20 which is so formed that the exhaust passages 21 from the exhaust ports 12 act as a heating jacket for separate intake passages 22 and 23 leading to the intake ports 13, the exhaust passage being beneath the level of the intake passages and the dividing wall 24 forming the floor of the straight portions of the intake passages. Thus the exhaust manifold forms an efficient hot spot for vaporizing liquid fuel deposited in the intake manifolds, the effect being increased

by the provision of low dams 25 at the engine end of the straight portion of each intake passage, which dams act to prevent the flow of liquid fuel towards the engine ports, the fuel being held on the hot surface of the dividing wall, until driven off in the form of vapor.

The individual intake ports lead to a twin or dual carbureter mounting flange 26, which may be conveniently disposed at one side of the manifold, in which case the lengths of the two intake passages are more nearly equalized with consequently improved equalization of distribution. As shown, a horizontal type of dual carbureter 27 is mounted on the flange 26, the carbureter having a single air inlet passage 28 controlled by the usual choke valve 29, and a single venturi 30 and fuel nozzle 31 feeding thereto. The fuel nozzle is of the air bleed type with the fuel supply from a float bowl 32 to the nozzle controlled by an adjustable needle valve 33; the air bleed well 34 surrounding the nozzle being fed air through a tube 35 anterior to the choke valve so as not to be cut off thereby.

Immediately posterior to the venturi 30 the mixture passage 36 divides into two symmetrical passages 37 which extend to the twin ports in the mounting flange, a cross shaft 38 carrying twin throttles 39, one for each passage 37. Individual idling mixture bypass passages 40 are provided which discharge into the passages 37 adjacent the edge of the throttle therein when the throttle is closed for idling. The division of the mixture outlet passage immediately posterior to the venturi assures a uniform source of fuel and air mixture to each manifold passage since the individual throttles serve to isolate or damper out pressure fluctuations, thus preventing the varying suction of one cylinder from affecting the supply to the other cylinder, the effect being especially marked under part throttle conditions.

In the operation of the engine and manifolding system of this invention the leading cylinder draws its charge through one intake passage and the following cylinder draws from the other duct. Since the intake periods of the two cylinders overlap to some extent, the separate throttles controlling the supply to the two intake passages act to prevent starving of the following cylinder the intake valve of which opens in advance of the closing of the intake valve of the first cylinder.

Under conditions of normal operation the common wall between the intake and exhaust passages serves as a hot spot, and the dams are provided to prevent waves of liquid fuel from flowing along the intake passages, which waves of liquid would otherwise result in uneven running due to the

irregularity in the waves of liquid which would produce overrich individual charges, especially as the horizontal carburetor and the manifold above the ports gives the effect of a down draft intake system wherein all fuel delivered by the carburetor nozzle eventually finds its way to the cylinders by gravity.

It will thus be seen that I have invented an improved carbureting system for engines having uneven firing intervals, wherein even distribution to the cylinders is assured together with improved mixture conditions under varying loads.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. In combination with a two cylinder four stroke internal combustion engine wherein the firing intervals are uneven, a combined exhaust and intake manifold therefor including individual downdraft intake passages for each cylinder in heat interchanging relationship to the exhaust passages therein, and a dual carburetor hav-

ing separate mixture outlet passages for said intake passages, said outlet passages being controlled by individual throttle valves.

2. In combination with a two cylinder internal combustion engine wherein the firing intervals are unequally spaced, a manifolding system therefor comprising a common exhaust manifold and individual downdraft intake passages for each cylinder, said intake passages being arranged in heat exchanging relationship with the exhaust manifold, and a dual carburetor separately feeding said individual intake passages.

3. In combination with a two cylinder four stroke internal combustion engine wherein the firing intervals are uneven, a combined exhaust and intake manifold therefor including individual downdraft intake passages for each cylinder in heat interchanging relationship to the exhaust passages therein, said individual intake passages having means therein to prevent the flow of liquid fuel to the engine, and a dual carburetor having separate mixture outlet passages for said intake passages, said outlet passages being controlled by individual throttle valves.

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